Journal of the Society of Arts.

FRIDAY, JULY 29, 1859.

BRITISH ASSOCIATION MEETING.

The meeting of the British Association for the Advancement of Science is fixed for the 14th of September, at Aberdeen. H.R.H. the Prince Consort will preside, and deliver the opening address.

OPENING OF GALLERIES OF ART IN THE EVENING.

The following report of the Commission appointed to consider the subject of lighting picture galleries by gas has been recently presented to the House of Commons:—

The Commission, consisting of Professors Faraday, Hofmann, and Tyndall, Mr. R. Redgrave, R.A., and Captain Fowke, R.E., appointed for the purpose of reporting to the Lords of the Committee of Privy Council on Education on the lighting of picture galleries by gas, and on any precautions (if necessary) against the escape of gas, and the products of its combustion,—having met at various times and considered the subject referred to them, now make the following report:—

There is nothing innate in coal gas which renders its application to the illumination of picture galleries objectionable. Its light, though not so white as that of the sun, is equally harmless; its radiant heat may be rendered innocuous by placing a sufficient distance between the gas jets and the pictures, while the heat of combustion may be rendered eminently serviceable in promoting ventilation.

Coal gas may be freed from sulphuretted hydrogen compounds, and in London is so at the present time; it then has little or no direct action on pictures. But it has not as yet been cleansed from sulphide of carbon, which, on combustion, yields sulphurous acid gas, capable of producing 22½ grains of sulphuric acid per 100 cubic feet of present London coal gas. [Hofmann.] It is not safe to permit this product of the combustion to come in contact with pictures, painted either in oil or water colours; and the Commission are emphatically of opinion that in every system of permanent gas lighting for picture or sculpture galleries, provision should be made for the effectual exclusion or withdrawal of the products of combustion from the chambers containing the works of art.

The Commission have examined the Sheepshanks' Gallery as an experimental attempt to light pictures with gas, and are of opinion that the process there carried out fulfils the condition of effectually illuminating the pictures and at the same time removing the products of combustion. According to the indications of the thermometer required and obtained, it does this in harmony with, and in aid of, the ventilation, and does not make a difference of more than one degree Fahrenheit at the parts where the pictures are placed, between the temperatures, before and after the gas is lighted.

Certain colour-tests, consisting of surfaces covered with white lead, or with vegetable and mineral colours (especially the more fugitive ones), and in which also boiled linseed oil, magylp, and copal varnish were employed as vehicles, had been prepared, and were, when dry, covered one-fourth with mastic varnish, one-fourth with glass, one fourth with both mastic varnish and glass, and one fourth left uncovered. Sixteen of these have been placed for nearly two years in different situations, in some of which gas has been used; in others not. They give no indications respecting the action of coal gas (except injury from heat in one placed purposely very near to and above the gas-burners), but seven of them show signs of chymical change in the whites, due to either a town atmosphere or want of ventilation. The most injured is that from the National Gallery, Charing-cross, and the next is from a country privy; the third, much less changed, is from the House of Commons; the fourth is from the Barber Surgeons'-hall; the fifth from the Bridgewater Gallery; the sixth from the Royal Society's rooms at Burlington-house; the seventh from the British Museum.

The remaining tests, hung in—1. Sheepshanks' Gallery, South Kensington; 2. Secretary's room at South Kensington, where no gas is used; 3. Mr. Henry Drummond's drawing-room at Albury-park, Surrey; 4. Sealed up and kept in a closet in the secretary's room at South Kensington; 5. Lambeth Palace, vestibule of the staircase; 6. British Institution, picture gallery; 7. Windsor Castle, room with a north aspect without gas; 8. Mr. Thomas Baring's picture gallery, 41, Upper Grosvenor-street, frequently lit with gas; present no observable change in this respect.

Though apart from the especial subject submitted to the Commission, the members cannot resist a recommendation that this kind of trial, which is especially a painter's experiment, should be continued for a longer period, and, indeed, be carried out on a more extensive scale.

The Commission think it right to state that they were unanimous on all the points to which their attention had been called, or which are referred to in this report.

M. FARADAY,
A. W. HOFMANN,
JOHN TYNDALL,
RICHD. REDGRAVE,
FRANCIS FOWKE, Captain, R.E.

South Kensington, July 20.

HISTORICAL ACCOUNT OF THE INTRODUCTION OF THE GALVANIC AND ELECTRO-MAGNETIC TELEGRAPH.

By Dr. Hamel, Member of the Imperial Academy of Sciences at St. Petersburg.

(*Concluded from page* 599.)

I have been endeavouring to find out from the papers of Soemmerring, whether he and Baron Schilling might have had a knowledge of the Italian Giandomenico Romagnosi's important discovery, made many years ago, that the magnetic needle deviates from its normal direction when under the influence of the galvanic current, and of which he had published an account in a newspaper, at Trent, on the 3rd of August, 1802. It began thus: "Il signore Consigliere Giandomenico Romagnosi si affretta a communicare ai Fisici dell' Europa uno sperimento relativo al fluido galvanico applicato al magnetismo."

I found that Baron Schilling, immediately after his return to Munich, in 1815, communicated to Soemmerring the little book "Manuel du Galvanisme," by Joseph Izarn, Professor of Natural Philosophy at the Lycée Bonaparte, which was printed in Paris in 1805, and in which, on page 120, in § ix., mention is made of Romagnosi's discovery. I have also seen a note from Soemmerring, mentioning that he had read this treatise with attention. I came, however, to the conclusion that neither to Soemmerring, nor to Baron Schilling, had any idea of a practical application of Romagnosi's observation presented itself, particularly as no rapid motion of the needle had been pointed out.

In the autumn of 1820, Soemmerring had decided to leave Munich for good, and to reside the rest of his life in his favourite place, Frankfort; he went there on the 13th October.

Letters show that the cordial friendship between him and Baron Schilling continued unchanged to the time of his decease, in 1830.

It is well known that in 1820 a new era for the art of telegraphing was dawning. Hans Christian Oersted, at Copenhagen, had directed the attention of the scientific world much more effectually than Romagnosi, in Italy, had done, to the fact that the magnetic needle deflects, when a galvanic current comes near it.

Arago, of the Academy of Sciences in Paris, received the information about Oersted's doings at the same time, and from the same source as myself.

It was in August, 1820, at Geneva, when I was making preparations for my second ascent of Mont Blanc, in order to follow out observations on the effects of the rare air at great heights on muscular motion, when Professor August Pictet, with whom I was then in daily intercourse, received Oersted's circular announcement in Latin: "Experimenta circa effectum conflictus electrici in acum magneticam," dated Copenhagen, July 21st. Just then Arago had come to Geneva, being on his way to Paris, where he intended to observe the solar eclipse on the 7th September.

At Pictet's request, Professor de la Rive repeated Oersted's experiment many times, as well with a powerful battery of 380 pairs of plates six inches square, as with a small one, made by Selligue, of twelve copper cups with a zinc plate in each. It happened that on the 19th of August, when De la Rive was experimenting with the said large battery, to show Arago and some scientific persons of Geneva the brilliant incandescence of charcoal-points when placed in the voltaic circuit, in the open air, and also in a vacuum, I was, much against my wish, detained on Mont Blanc, at the Grands Mulets, the whole day, as well as the preceding and following night, in clouds discharging flashes of lightning.

I cannot forego stating my belief that Oersted knew of Romagnosi's discovery, announced in 1802, which was eighteen years before the publication of his own observations. It was mentioned in Giovanni Aldini's (the nephew of Galvani's) book: "Essai théorique et expérimental sur le Galvanisme," printed at Paris in 1804, and dedicated to Bonaparte, to whom, in Italy, he had had the honour to explain experiments relating to his uncle's great discovery.* He says, at page 191: "M. Romanesi, physicien de Trente, a reconnu que le galvanisme faisait décliner l'aiguille aimantée."

Oersted was in Paris in 1802 and 1803, and it appears from the book of Aldini that Oersted, at the time he finished it, was still in communication with him, for he says at the end (page 376), he had not been able to add the information received from Oersted, Doctor of the University at Copenhagen, about the galvanic labours of scientific men in that country, nor that relating to new apparatus invented by himself. In 1813 Oersted had been again in Paris.

Who would suppose that Oersted did not know everything contained in Aldini's book, in which even the index points to Romagnosi's discovery in the following words: "Romanesi a fait des tentatives sur l'aiguille aimantée, page 191"?

In Izarn's "Manuel" of 1805, above quoted, the mention of Romagnosi's discovery is evidently taken from Aldini's book of 1804. The words there are: "D'après les observations de Romagnési, physicien de Trente, l'aiguille déjà aimantée et que l'on soumet au courant galvanique, éprouve une déclinaison." Now, this is literally what, since 1820, the world has been accustomed to call Oersted's discovery.

* Aldini wrote in his dedication to Bonaparte, who was then First Consul: "Il sera mémorable à jamais dans les fastes de l'Histoire du Galvanisme le jour où, descendu à peine en Italie, vous me permîtes d'en développer devant vous les principales expériences au milieu des vastes occupations militaires et politiques dont vous étiez environné. Le souvenir de cette époque honorable m'enhardit à vous dédier cet ouvrage."

As Oersted must have known Romagnosi's experiment, it would have been an additional credit to him, if, in 1819 and 1820, on making known his own observations, he had just said a word about Romagnosi as pioneer in the field on which be became loaded with laurels.

In Alessandro de Giorgi's collection of the works of Romagnosi, printed at Milan, there is prefixed to the first volume a likeness of him, engraved from a painting by Ernesta Bisi. I wish somebody would copy it by photographic means, and then multiply this portrait by the same process, for distribution among the lovers of electrical science. I can, for a similar purpose, furnish the portrait of Baron Schilling.

Arago had hardly got to Paris, when, on the 4th September, he communicated to the Academy of Sciences what he had seen at Geneva. He was requested to repeat Oersted's experiment, which he did at the sitting of the Academy on the 11th. Two weeks after that Arago communicated to the Academy his observation that the galvanic conductors attracted needles that were not magnetised.

It deserves here to be remembered that, from Aldini's book, it was known that the chemist Giuseppi Mojon, at Genoa, had, before 1804, observed in unmagnetised needles, exposed to the galvanic current, a sort of polarity. Izarn repeats this also in his "Manuel du Galvanisme," which book was one of those that, by order, were to be placed in the library of every Lycée in France.

Ampère, who, as is well known, bestowed most particular attention on the subject brought, in 1820, before the scientific world through Oersted, mentioned that it might perhaps be possible to make use of the deviation of the needle for telegraphic purposes, but neither he nor any one else then constructed such an instrument.

It was reserved for Baron Schilling, at St. Petersburg, to make the first electro-magnetic telegraph. Having become, as we know, through Soemmerring, at Munich, passionately fond of the art of telegraphing by means of galvanism, he now used for it the deflection of the needle, which he placed within the multiplier of Schweigger horizontally on a light vertical axle hanging on a silken thread, and bearing a circular disc of paper, coloured differently on each side. To make the needle move steadily and prevent oscillations, Schilling had fixed to the lower extremity of its axle a strip of thin platina plate and immersed it in a cup of mercury. By degrees he simplified the apparatus. For a time he used five needles, and, at last, he was able to signalise even with one single needle and multiplier, producing by a combination of movements in the two directions all the signs for letters and numbers. Having known Soemmerring's alarum, Schilling invented one for his telegraph also. His success in bringing his instrument to a state of high perfection would have been much more rapid, had his time not been so much occupied with various duties, and particularly with the founding and directing of a large lithographic establishment for the government.

Baron Schilling's telegraph was an object of great curiosity at St. Petersburg; it was frequently exhibited by him to individuals and to parties. Already the Emperor Alexander I. had been pleased to notice it in its earlier stage, and, when it was reduced to great simplicity, his Majesty the Emperor Nicholas honoured Baron Schilling, on the 13th of March, 1830, with a visit at his lodgings in Opotchinin's house, in the Konooshennaja, to see experiments performed with it through a great length of conducting wires.

His Majesty had long before repeatedly witnessed in the summer camp, near St. Petersburg, the exploding of mines by means of Schilling's carbon igniters through conducting ropes at great distances. Once Baron Schilling had the honour to present to the Emperor, in his tent, a wire. He begged his Majesty to touch with it another wire, whilst looking through the door of the tent in the direction of a very far distant mine. A cloud of smoke with earth rose from this exploding mine at the moment the Emperor, with his hands, made the contact. This caused great sur-

prise, and provoked expressions of satisfaction and applause.

In May of the last-mentioned year, 1830, Baron Schilling undertook a journey to China. He had a strong propensity for studying the language, and everything relating to China. His most ardent desire was to be able to visit Pekin, but he was obliged to confine his travels to the borders of the Empire. He collected in Mongolia a great quantity of precious Chinese and Mongolian writings, which are now preserved in the Imperial Academy of Sciences in St. Petersburg. He had a small electro-magnetic telegraphical apparatus with him, and the astonishment which the experiments, performed with it, excited, assisted him not a little to obtain many of the most interesting works, which he would not have got by simply paying for them.

After his return from the borders of China to St. Petersburg in March, 1832, Baron Schilling occupied himself again with the telegraph, and in May, 1835, he undertook a journey to the West of Europe, taking his simplified instrument with him.

In the month of September he attended the meeting of the German Naturalists at Bonn, on the Rhine, where, on the 23rd, he exhibited his telegraph before the section of natural philosophy and chemistry, over which Professor Georg Wilhelm Muncke, of the University of Heidelberg, presided. Muncke, who had been ever since 1826 an honorary member of the Imperial Academy of Sciences at St. Petersburg, was much pleased with Schilling's instrument, and he determined at once to get one for exhibition at his lectures.

I have lately, at Heidelberg, in the Western Main Street (Westliche Hauptstrasse), opposite the former convent of Dominicans, in the upper story of the house under No. 52, called: Zum Riesen, where, at present, the Cabinet of Natural Philosophy is located, found in a store-room, belonging to it, the apparatus which Professor Muncke got made in imitation of the one exhibited by Baron Schilling at Bonn.

We know now, that Baron Schilling brought his electro-magnetic telegraph from St. Petersburg to Bonn, and that a similar one was made for Heidelberg. It remains to trace out how Schilling's contrivance found its way from Heidelberg to London.

It will surprise many to learn that the individual who became the cause of this being done was, when a new-born child, mentioned by Lord Byron.

In a letter which Lord Byron wrote on the 20th of February, 1818, from Venice to the publisher of his productions, Mr. John Murray, in Albemarle-street, London, he says at the end, "Mr. Hoppner, whom I saw this morning, has been made the father of a very fine boy. Mother and child are doing very well indeed.*

The father of this child, Richard Belgrave Hoppner, was one of three sons of John Hoppner, the celebrated portrait painter, who, even at the time of his birth, in 1759, had received special attention from King George III., and who died as one of the Royal Academicians on the 25th of January, 1810.†

R. B. Hoppner—whose name is known to us in Russia, because, in 1813, he translated from the German into English, our Admiral Krusenstern's "Voyage round the world in the years 1835-6"—was married in September, 1814, at Brussels, to Mademoiselle Mary Isabelle May, daughter to Beat Louis May, living in the Canton of Berne, in Switzerland. In November of the same year he was appointed Consul-General at Venice and the Austrian territories in the Adriatic.

Lord Byron, when at Venice, in 1817, became a great friend of his, as may be seen from his letters, out of which not less than eighteen are printed by Thomas Moore in his "Letters and Journals of Lord Byron." In several of them he alludes to Hoppner's, then "little, son."

On examining at Heidelberg the books in which the names of the students at the University are entered, I found that this John William (the name Rizzo is not mentioned) Hoppner became a student there in 1834. He applied himself particularly to those branches that would enable him to become a civil engineer; indeed, he was subsequently for a time employed by Mr. Robert Stephenson, on the making of the railroad from Florence to Leghorn. With his subsequent history we have here nothing to do.

During the winter of 1835-6, he was lodged at Heidelberg in Engelman's house.

I now have to speak of the gentleman who, through John William Rizzo Hoppner, was induced to transfer Baron Schilling's mode of telegraphing to England.

William Fothergill Cooke, who, as a young man, had, been six years in India in military service, had, in 1831, come to England on leave to visit his parents, and had, soon after that, left the service altogether. His father, Dr. William Cooke (who died on the 21st March, 1857), had for some time lived at Durham, and was subsequently appointed Reader in Medicine at the then lately organised University there. He began his lectures in 1833.

W. F. Cooke, wishing to make for his father anatomical models in wax to be used at his lectures, went to Paris, where he attended, during the winter of 1833-4, lectures on anatomy. In the spring of 1834 he returned to Durham, and made there such models as his father most wanted. In the summer of 1835 he accompanied his parents on a tour to Switzerland. Ascending the Rhine, Heidelberg was visited. Here Professor Tiedemann, the director of the then existing Anatomical Institute, offered to assist young Mr. Cooke in procuring the necessary means for making preparations in wax for his father, if he would come back to Heidelberg.

Accordingly, W. F. Cooke returned in the month of November from Berne, in Switzerland, to Heidelberg, where he lodged in the Plöckstrasse, in the house No. 97, at that time belonging to the brewer Wilhelm Speyrer, but now to the brewer Georg Müller. It bears the strange inscription: "Bierbrauerei zum neuen Essighaus." There had been before vinegar works in that house.

As Mr. Cooke was not permitted to make here, in the cleanly-kept apartments, anatomical dissections, he hired a room in the same street, nearly opposite, in the house of the gardener Schwartz, No. 58, now belonging to his grandson, the turner Ferdinand Koch. Here during the winter he was so active, that at the end of it he was able to send off four cases full of models in wax to his father at Durham.

In the present Anatomical Museum at Heildelberg, finished in 1848, I have, under Nos. 382, 383, and 628, found three wax models, made by Mr. Cooke during the winter mentioned. The one under No. 628 is marked W. F. C., Dunelm.

In the beginning of March 1836, Mr. Cooke heard accidentally from John William Rizzo Hoppner, with whom he had formed an intimate acquaintance, because his relations lived in the Canton Berne, where Mr. Cooke had been with his own parents, that the professor of natural philosophy had an apparatus with which he could signalize from one room to another. This was Baron Schilling's telegraph, but Mr. Hoppner did not know it.

The professor was no other than the already mentioned Geheime Hofrath Muncke. He had in the upper story of the former Convent of Dominicans, where he gave his lectures, and where he also lived, suspended wires for telegraphing out of the Cabinet into the Auditory.

* The child being christened: John William Rizzo, Byron wrote four lines in verse, which have been printed, not only in the original English, but also metrically translated in ten other languages, which translations, with the exception of the Armenian, are to be seen in Murray's "Poetical Works of Lord Byron," p. 571.

† Another son of his, Henry Perkyns Hoppner, had accompanied Lord Amherst in 1816 to China, and is known as a navigator in the Arctic Seas with Parry and Ross. He died on the 23rd December, 1833. The third son, Lascelles drew, as a first artistic production, the frontispiece to the father's translation of "Oriental Tales," printed in 1815.

I have examined these localities; the rooms are now quite empty. When I was there the floors were used to dry hops, spread out on them. From the year 1850 to 1852, the house had served as a military barrack.

As Mr. Cooke was curious to see the telegraphing out of one room into another, Mr. Hoppner took him on the 6th of March, 1836, to Professor Muncke's lecture room.

When Mr. Cooke saw the telegraphing, and was told that the instrument could work through great distances, the idea struck him that such a thing might be useful in England, particularly in tunnels along the railroads, which were at that time spreading more and more, and he determined to give up at once his anatomical occupation at Heidelberg, get such an apparatus as the Professor used made, and go to England, to endeavour to get such telegraphs there brought into use.

Mr. Cooke, who had never occupied himself with the study either of natural philosophy in general, or of electricity in particular, did not at all get further acquainted with Professor Muncke; he did not even acquire his name properly; he calls him Möncke. He had no idea that the apparatus he had seen had been contrived by Baron Schilling in Russia. He did subsequently suppose that Professor Möncke might have had the idea from Gauss, whom he calls Gaüss.

Let us see how Mr. Cooke himself, some years afterwards, in 1841, describes what I have here, from my own investigation, detailed.

He wrote: "Having returned from India on leave of absence, on account of the state of my health, and afterwards resigned my commission, I was studying anatomy and modelling my dissections, at Heidelberg, when, in March 1836, I happened to witness one of the common applications of electricity to telegraphic experiments, which had been repeated without practical result for half a century. Perceiving that the agent employed might be made available to purposes of higher utility than the illustration of a lecture, I at once abandoned my anatomical pursuits, and applied my whole energies to the invention of a practical Electric Telegraph."

Who could, on reading this, have discovered that Mr. Cooke had seen experiments performed with a copy from the electro-magnetic telegraph made by Baron Schilling at St. Petersburg, and brought by him, six months before that time, to Bonn, the working of which is here mentioned by Mr. Cooke as "one of the common experiments repeated for half a century;" consequently, even before either electro-magnetism or a voltaic battery had been discovered?

When, in consequence of unpleasant disputes between Professor Wheatstone and Mr. Cooke, Sir Isambard Brunel and Professor Daniel were, in 1840, appointed arbitrators, they, without taking the trouble to find out what telegraph Mr. Cooke had seen, said, in their award (1841), that, "in March 1836, Mr. Cooke, while engaged at Heidelberg in scientific pursuits, witnessed, for the first time, one of those well known experiments on electricity, considered as a possible means of communicating intelligence, which have been tried and exhibited from time to time, during many years, by various philosophers."

On another occasion, Mr. Cooke intended to give the name of the person whom he saw signalizing with a telegraph, but where this telegraph came from he did not know. He wrote: "In the month of March, 1836, I was engaged at Heidelberg in the study of anatomy, in connexion with the interesting and by no means unprofitable profession of anatomical modelling, a self-taught pursuit to which I had been devoting myself with incessant and unabated ardour, working frequently fourteen or fifteen hours a day, for about eighteen months previous. About the 6th of March, 1836, a circumstance occurred which gave an entirely new bent to my thoughts. Having witnessed an electro-telegraphic experiment, exhibited about that day by Professor Möncke of Heidelberg, who had, I believe, taken his ideas from Gaüss, I was so much struck with the wonderful power of electricity, and so strongly impressed with its applicability to the practical transmission of telegraphic intelligence, that from that very day I entirely abandoned my former pursuits, and devoted myself thenceforth with equal ardour, as all who know me, can testify, to the practical realization of the Electric Telegraph, an object which has occupied my undivided energies ever since. Professor Möncke's experiment was at that time the only one upon the subject that I had seen or heard of."

Mr. Cooke states, that within three weeks after he had seen Professor Möncke's telegraph, he had got made, partly at Heidelberg (where Mr. Hoppner assisted him), and partly at Frankfort, a similar one, but with three needles, with which he could produce 26 signals.

He came to London on the 22nd of April, 1836. There he applied himself, as he says, almost night and day, to the making of his so-called mechanical instrument, worked by the attraction of an electro-magnet, which in January, 1837, he submitted to several of the leading gentlemen connected with the Liverpool and Manchester railway, proposing its adoption in the long tunnel close to Liverpool, which descends from Edgehill to the station in Lime-street, but this proposal was not followed out.

Having twice consulted Dr. Faraday, Cooke, by the advice of Dr. Roget, visited, on the 27th February, 1837, Professor Charles Wheatstone at his residence, in Conduit-street, and was soon after taken by him to his rooms in King's College.

The result of Cooke's acquaintance with Wheatstone was, that, in May, 1837, they resolved to unite their efforts in endeavouring to introduce the use of telegraphs in England.

Professor Wheatstone was at that time not yet sure whether the electro-magnet would work sufficiently well at considerable distances, and Mr. Cooke, who had left on the continent the instrument made at Heidelberg, constructed another like it with four deflecting needles. The opinion was, that the principle on which "Möncke's" instrument worked would be the best to adopt for practical use. Neither Professor Wheatstone, nor Mr. Cooke, knew that in so doing they were adopting Baron Schilling's plan.

On the 12th June a caveat for a patent was lodged, and it was determined to institute an experiment with the projected telegraphic apparatus on a line of some extent.

Accordingly, on the 25th July, a trial was made at the terminus of the London and Birmingham Railway, then constructing, along wires one mile and a quarter in length, from Euston-square to Camden Town. This was the first instance of out of door telegraphing in England with a galvanic apparatus. It took place thirteen days before the decease of Baron Schilling, who died at St. Petersburg, on the 7th of August, without getting informed of the introduction of his telegraph into England.

On the 19th of November, 1837, Messieurs Cooke and Wheatstone concluded a partnership contract, and on the 12th December they gave in the specification of their apparatus. It was not called a new invention, but an improvement. Indeed, it was in the essential part founded on the same principle as Baron Schilling's, namely the deflection of needles by multipliers. Professor Wheatstone had, as was to have been expected from such a philosopher, greatly improved the application; the needles were placed in a vertical instead of the horizontal position. At first he made an instrument with five such needles, but subsequently telegraphs with two needles, and also with one needle, were adopted along the various lines.*

Mr. Cooke's merits, in having with great zeal laboured in the practical establishment of the first telegraph lines in England, are well known.

About a fortnight before the above-mentioned first and perfectly successful trial of telegraphing by Cooke and Wheat-

* It was, in 1838, erroneously stated to the Academy of Sciences in Paris, that Baron Schilling had "vertical" needles in his telegraph, and the Abbé Moigno, quoting this communication, even says that there were "five vertical" needles.—Schilling had not one vertical needle.

stone in England, Steinheil, at Munich, had completed the junction of his house in the Lerchenstrasse with the building of the Academy of Sciences, and with the Royal Observatory at Bogenhausen, by means of 36,000 feet of wire for conducting the current both ways, the wires being suspended in the air. Already, in 1833, the Cabinet of Natural Philosophy, of the University at Göttingen, had been united, by Professor Wilhelm Weber, for electro-magnetic signalising, with the Astronomical Observatory, distant 3,000 feet, to which, in 1834, was added the Magnetic Observatory, situated near it.

Baron Schilling, during the journey which he undertook, in 1835, had made, together with Baron Jacquin and Professor Andreas von Ettingshausen, at Vienna, a series of experiments, with a view to find out the comparative merits of placing the conducting wires over the roofs of houses in the air, and of laying them in the earth. The latter trials were made in the botanical garden of the University, near the Rennweg. The result was like that obtained subsequently by Steinheil, at Munich, namely, that the earth conducted the current from one wire to the other laid at some distance parallel, which was then still supposed necessary for the return of the current. Steinheil had been led to make a trial of laying the wires in the earth, because at Göttingen the wires in the air had been several times injured by strong winds. Baron Schilling, Baron Jacquin and Professor Ettingshausen, at Vienna, concluded that the suspending of the wires in the air was the better method.*

After all that had been accomplished before the month of September, 1837, in Europe by Baron Schilling, by Steinheil, by Weber and Gauss, and by Cooke and Wheatstone, it is offensive to observe that in America the painter Morse, who made, on the 4th September, 1837, a poor experiment which he considered "successful," is held out as having made an electro-magnetic telegraph before anybody in Europe.

Samuel Finley Breese Morse,† born 1791, the eldest of three sons of the late Rev. Jedediah Morse, known for his geographical publications, having a taste for painting, and wishing to study this art, had for that purpose, from 1811 to 1815, been in England (at London and Clifton). At the close of 1829 he came again to Europe, and went by London and Paris to Rome and Naples, thence back to Paris, where he remained about a year to copy paintings in the Louvre. In the autumn of 1832 he returned from Havre to America.

On board the packet ship, the Sully, there was, among other passengers, Dr. Charles T. Jackson, of Boston, who had attended in Paris, besides other lectures, those of Pouillet, at the Sorbonne. I call to mind here that Pouillet the year before, in 1831, had had made his large electro-magnet, which supported the weight of more than one thousand kilogrammes.

During the voyage, which lasted from the 8th of October to the 15th of November, Dr. Jackson repeatedly directed the conversation to the subject of electricity and electro-magnetism, which gave occasion to speak about the possibility of electro-magnetic signalising or telegraphing. Dr. Jackson had with him on board a small electro-magnet, which he had bought in Paris, at Pixii fils, and also a small galvanic battery. He pointed out some means as likely to serve for the purpose mentioned, by sketches, some of which I have seen in Dr. Jackson's pocket-book.

* I must here remark that in works on the Electric Telegraph, printed in Great Britain and in America, is copied over and over again an article erroneously extracted from a memoir in German, by Julius Hülsse, in his journal "Polytechnisches Central Blatt (2nd and 7th June, 1838)." This article says: "It appears that Messieurs Taquin and Ettieyhausen (likewise written Entyihausen) established a line of telegraph across the streets in Vienna." These corrupted names stand for Baron Jacquin and Professor Ettingshausen, who made at Vienna the above mentioned experiments along with Baron Schilling.

† Breese is the family name of his mother, whose grandfather was the Rev. Samuel Finley.

Arrived at New York, Morse endeavoured to gain his livelihood, as had been the case formerly, by painting portraits.

He being now always called Professor, most persons believe that he is a professor of natural philosophy, or some other branch of natural science, but this is not the case. In 1835 he got the title of "Professor of the Literature of the Arts of Design." It was supposed that he might, in the so-called University of the city of New York, where he was then lodged, lecture on that subject, but he has never, as I know from himself, given one single lecture thereon to pupils.

As his occupation in painting portraits, ever since his return in 1832, hardly produced him the means of supporting himself, he, towards the end of 1835, after Baron Schilling's exhibition of his telegraph at Bonn, took it into his head to try to arrange something for signalising by means of electro-magnetic action, of the possibility of which Dr. Jackson had informed him, but his trials remained without success, because he did not know what was wanted to make a powerful magnet. Two years later, in 1837, when news of the above described doings in Europe reached America (his brother Sidney was editor of a newspaper), he, with the aid of a scientific gentleman, who knew what Professor Henry, at Princeton, had done with regard to electro-magnets, produced something which, however, was not at all fit for practical use.

Professor Henry and Professor Bache, from America, had been, in 1837, in London, and had visited Professor Wheatstone in King's College on the 11th of April, which was six weeks after Mr. Cooke had been with him. During the summer Professor Wheatstone had signified to some Americans his wish to make an application for a patent at the Patent Office in Washington.

Morse's idea, then, was not to produce on paper letters or signs representing them, but to have only ten signs for the nine digits and the zero. With these he proposed to express numbers on strips of paper. In an alphabetical vocabulary the words were all numbered. He had an eleventh sign which served to indicate that the next following signs were really to represent numbers, not words. For each of the signs mentioned, he had a metal type with a certain number of Λ shaped projections. These types he introduced, one after the other, into a port-rule by which they were moved forward. The teeth of the types were to lift a lever, by means of which the electric current was allowed to flow through the coils of an electro-magnet, causing it to attract an armature fixed to a moveable vertical lever having at its lower end a pencil, which marked on a strip of paper, passing slowly over a roller, zig-zags somewhat like the teeth of a saw.

To find out afterwards what the groups of zig-zags meant, one had to convert the digits they represented into numbers, and then look into the vocabulary for that number to learn what word was meant by it.

It was Dr. Leonard D. Gale, Professor of Chemistry, living in the same building as Morse, who had instructed him how to make the coils for an electro-magnet; he also procured him the necessary wire, and lent him a proper galvanic battery. Morse made him afterwards his partner, and he, from 1846, held, until lately, a situation in the Patent Office.

When, at the end of August, 1837, amongst other news from Europe, there came in a German newspaper (it was the "Neue Würzburger Zeitung," of the 30th June), an account of Steinheil's doings at Munich, which was translated into a New York paper on the 1st of September, there was, through Morse's influence, on the following day, an article printed, saying that the editors of newspapers in America, who copy such articles from European papers, do not seem to be aware, that the electric telegraph which now, as the wonder of the age, seems to have excited in Europe the attention of the scientific public, was an American discovery, and that Professor Morse had conceived it five years ago, on his return from France to America. It was added: "that Morse had on board the ship made no secret of the general

idea, but communicated it freely to his fellow passengers of all nations, who were in the ship."

Was not this to make the Americans believe that Baron Schilling, Steinheil, Weber, Gauss, Cooke and Wheatstone had learnt from their painter Morse the art of telegraphing by electro-magnetism? As it was also mentioned that Morse had his telegraph then at his lodgings, there came on the same day several curious persons to see "the wonder of the age." One of them was Dr. Daubeny, from Oxford, in England. Another was a young gentleman, Alfred Vail, who afterwards became very useful to Morse, for he, with his brother George, made at the Speedwell iron works near Morristown, in New Jersey, belonging to them, a much better instrument than that invented by Morse. Alfred Vail became, like Dr. Gale, Morse's partner.

On the day mentioned, the 2nd September, Morse's machine would not mark anything correctly. Great efforts were employed to make it do better, and two days later, on the 4th of September, Morse at last succeeded in getting by it the numbers representing five words and the date, marked. For this were wanted not less than sixty-two zig-zags, and fifteen straight lines on the slip of paper; the figure drawn on it, looking somewhat like a saw-blade, with teeth here and there broken out. They represented the following numbers: 215, 36, 2, 58, 112, 04, 01837. Searching in the vocabulary for the meaning of these numbers, it was found that they were to express: "Successful experiment with telegraph September 4 1837"

The triumph was immediately sent for publication to the editor of the last mentioned newspaper, and also to Professor Silliman at Newhaven, the editor of the "American Journal of Science and Arts," and with it was sent a representation of the wonderful production. It is to be seen on page 168 of the 23rd volume of the said Silliman's Journal; also in the London Mechanics Magazine of the 10th of February, 1838.

Morse wrote at that time: "I assert to be the first proposer and inventor of electro-magnetic telegraphy, namely, on the 19th October, 1832, on board the packet Sully, on my voyage from France to the United States. . . . All telegraphs in Europe are, without one exception, invented later than mine."

So spoke the painter Morse in America, after having with the machine, which Dr. Gale had assisted him to construct, on the 4th September, 1837, obtained the described poor result. He claimed priority to everything done in Europe in the department of telegraphy. His, for practical purposes, worthless result he had obtained four weeks after the death of our Baron Schilling, who, as we know now, had twenty seven years before that time, (1810) at Dr. Soemmerring's, at Munich, got acquainted with the first galvanic telegraph in the world, who, above a dozen years previous had made at St. Petersburg the first electro-magnetic telegraph, which he had himself two years before exhibited to the meeting of the Naturalists at Bonn, where it had so pleased that it was taken immediately to Heidelberg, and half-a-year afterwards from thence to England. Here a telegraph on the principle first used by Baron Schilling, had, forty-one days before the 4th September, been at work over a mile and a quarter of line at the terminus of the railroad, near Euston-square, in London, and Schilling had not long before his decease, at a rope manufactory at St. Petersburg, ordered a submarine cable to be made to unite Cronstadt with the capital through the Gulf of Finland for telegraphic correspondence.

It is to be regretted that Morse, when, in 1838, he with, and at the expense of, a commercially interested member of Congress, Francis O. J. Smith, came to Europe, wishing to get his apparatus patented in England and in France, was in Paris told that Baron Schilling had invented his electro-magnetic telegraph some time after his return from the frontiers of China, in December, 1832, and in 1833. This erroneous statement became for Morse a welcome encouragement to confirm to himself the ill-founded priority of October, 1832, and, unfortunately, in many works printed since that time, Baron Schilling is stated to have invented his telegraph in 1833.

We have seen what sort of a telegraph Morse, with the aid of Dr. Gale, had (in 1837) invented. It was a thing quite useless for practical purposes. Alfred Vail, with his brother, very soon after, made for Morse a better one, and, in the course of a good many years, a practically very useful instrument was brought about, which goes by the name of Morse's.

The first telegraph line in England was constructed by Mr. Cooke, from London (Paddington) along the Great Western railroad to West Drayton, in 1838-39. In 1840, he established the telegraph along the Blackwall railway, and, in 1841, along that between Edinburgh and Glasgow. In 1842-3, the line from West Drayton was continued to Slough. It served, on the 1st of January, 1845, to apprehend the murderer Tawell, which circumstance brought the telegraph at once into great repute and demand. In America, the first line, from Washington to Baltimore, was completed in 1844. On the 24th of March in that year, the first short sentence of four words was telegraphed along it. This sentence, in consequence of an invitation from Morse, was dictated by the daughter of his friend, the chief at the Patent Office, Mr. Ellsworth. I found this first American original telegram preserved in the Museum of the Historical Society at Hartford, in Connecticut, and have not failed to take an exact copy of it.

I do not intend at present to say more about the spreading of the telegraph in both hemispheres. My object here was to give a true and accurate account of the first beginning of the art of telegraphing by means of galvanism.

I have shown that in the month of August this year (1859) it will be half a century since the first galvanic telegraph was made, and I have further demonstrated that it was the Russian Baron Schilling's electro-magnetic telegraph which, without its being known to be his, was brought to London, and caused the establishment of the first practically useful telegraph lines, not only in Great Britain, but in the world.

The small sprout, nursed on the Neva, which had been exhibited on the Rhine, and thence brought to the Thames, grew up here to a mighty tree, the fruit-laden branches of which, along with those from trees grown up since, extend more and more over the lands and seas of the Eastern hemisphere, whilst kindred trees, planted in the Western hemisphere, have covered that part of the world with their branches, some of which will, ere long, be interwoven with those in our hemisphere.

THE NEW THAMES GRAVING DOCK.

On Wednesday last a party of scientific, engineering, and commercial gentlemen attended, on the invitation of the directors of the company formed for establishing these docks, to witness an experiment for testing the efficacy of Mr. Edwin Clark's patent process for raising ships, by means of hydraulic pressure, for the purpose of examination and repair.

These docks are situated at North Woolwich, and are in connection with the Victoria Docks.

Under the old plan of graving, careening, or repairing docks it was necessary to excavate each dock to a depth sufficient to float the largest ship intended to be repaired, and to construct at the entrance of each dock a flood gate, or pair of gates, to keep the water out. For ships of the size now in common use the depth of a repairing dock must be about twenty four feet, causing a heavy expense for excavation and retaining walls of masonry, independently of the cost of the tidal gates. An entry into docks of this construction is effected at, or soon before, or after, high water. The gate is then closed; and at low water, on a tidal sea, the water is allowed to run out until the ship is

left dry for examination or repair in a sort of pit, always damp, and in winter, soon dark. In tideless seas a graving dock must be emptied by the slow and expensive process of pumping. The new process obviates these difficulties and delays. A floating stage or pontoon is placed in a basin or water-way, and the vessel requiring examination or repair is floated upon it, and by the application of hydraulic pumps the stage, with the vessel upon it, is raised, and becomes a working platform, upon which the vessel, lifted up high and dry as in a dry dock, may be caulked or coppered or repaired as her necessities may require. The hydraulic lift consists of two parallel rows of sixteen cast-iron columns, each 5 feet in diameter, and 60 feet in length, sunk into the ground, under the water, about 12 feet. These columns are 20 feet apart in each row, and the clear space between the two rows is 60 feet. Each column contains a hydraulic press 10 inches in diameter, and of 25 feet stroke, the top of the press being at the ordinary level of the water. The ram of each press carries a small cross-head, from which are suspended, by means of descending rods, two wrought-iron girders 60 feet in length, which extend entirely across the dock to the corresponding column and press on the opposite side. There is thus a series of thirty-two suspended girders extending entirely across the dock; and when the presses are lowered, lying at the bottom of the dock in 28 feet of water; these form a large wrought-iron gridiron, which by means of the presses may, with a vessel upon it, be raised out of the water or lowered at pleasure. The vessel to be docked is not raised directly upon the gridiron, but upon a wrought-iron pontoon, proportioned to the size of the ship to be docked. This pontoon is first placed on the gridiron, and sunk with it to the bottom of the water. Then the ship is brought between the columns and over the pontoon, and a 50-horse engine working the hydraulic presses, raises the whole pontoon together. At this stage of the proceedings the pontoon empties itself of water through valves provided for the purpose; the valves are then closed, and the girdiron being again lowered to the bottom, the pontoon, with the vessel seated upon it, is left afloat on the surface. The shoring of the vessel (a work of difficulty and cost under the old plan) is accomplished by large moveable frames or sliding wedges, which, while under water, are drawn into close contact with the vessel, so that she sits on a huge timber cradle without the possibility of being strained. In less than 40 minutes a vessel drawing 19 or 20 feet of water is thus left afloat on a shallow pontoon, drawing only 4 or 5 feet. At the Victoria docks the lift consists of 16 columns, which give a working length of more than 340 feet. Perfect horizontality while lifting is secured, by arranging the presses in three independent groups. Those in each group are all connected together, so that perfect uniformity of pressure is secured as regards the individual presses in each group, while the three groups themselves are so arranged that their three centres of action form a tripod support, upon which the vessels and pontoon are seated, and any point of the tripod may be raised or lowered independently of the other two. By this process it is said that the Himalaya, one of the largest vessels in existence, may be completely docked in two hours, while from eight to ten ordinary vessels may be raised, examined, and launched again per day.

The floating pontoon has great advantages over the old pit-dock in light, air, and dryness. The men can work more hours in winter, paint dries more quickly, and there are no inconveniences from damp dark walls.

According to the statement of the company, the general advantages of the new system may be summed up under the following heads:—1. Independent of tides, and at all times, whether by night or by day, vessels of the largest dimensions, whether empty or loaded, may be raised out of the water for examination. 2. The vessel thus raised is transferred by floatation, without rails or slip, to suitable docks for its repair, where it lies high and dry on a convenient timber platform, on the same level as the repairing shops with which it is surrounded. In painting vessels, free exposure to the air is a most important advantage. 3. One single lift or apparatus for raising is sufficient for docking an unlimited number of vessels. 4. The method employed in raising and transporting vessels renders it impossible to damage them by any unequal strains. 5. The support of the vessel by cast-iron columns affords means of constructing such docks either in open water, in tideless seas, or in almost any locality, independent of the character of the soil.

The vessel experimented upon on Wednesday was a fine ship of 870 tons register, or some 1,200 tons burden, the Jason, an Aberdeen clipper, which was floated upon the stage, and by the application of the hydraulic pumps was in about twenty minutes brought up out of the water, and floated on the pontoon.

JAPAN WAX.

A hard, solid, vegetable wax has for some time been imported in small quantities from Japan, in small, thin, oval cakes, with Japanese characters, coming through Singapore and China. But since the opening of the Japanese ports to British traders, it has come forward in large quantities, in square blocks or cases of about a picul each, 133⅓ lbs. The American ship Florence brought over in April, about 500 tons, consigned to Messrs. Baring, Brothers, and samples of the bunches of fruit from which it is expressed, were also brought over. These fruits are, in appearance, like small shrivelled or unripe grapes. Small sales of this cargo have been made at 70s. per cwt.; but the bulk hangs on hand. Another vessel, the Versailles, with a large cargo of 500 or 600 tons, is expected daily. At Hamburgh, there has been an importation of about 374 chests of this wax. The following account of the Japan wax is from the *China Telegraph*, furnished by Mr. P. L. Simmonds:—

"The shrub or tree yielding this solid butter or fat, which is becoming such a large and important article of commerce, belongs to the *Anacardiacæ* family. There are a great many species, and, as they are poisonous, the leaves and shoots should not be handled by children. Several of them yield, however, important commercial products. The dried and chopped leaves and shoots of *Rhus coriaria* and *cotinus*, under the name of sumach, form a large article of commerce in the south of Europe, and we import about 19,000 tons a year for the use of tanners and dyers. Containing a good deal of tannin, it is powerfully astringent, and is used to stain leather yellow. The juice of *Rhus radicans* and *R. toxicodendron*, North American species, is milky, stains black, and is extremely poisonous. *Rhus succedanea*, the species which furnishes the Japan wax, has long been grown in our greenhouses, having been introduced from China nearly a century ago. It might be raised, we should suppose, in the Cape and Australian colonies, in the Mauritius, and India; and would be far preferable as an oleaginous plant to the species of candle-berry myrtles from which wax is obtained. It will grow in any common soil, and may be readily increased by ripened cuttings. We shall probably soon learn what is the ordinary mode of culture in the plantations of Japan, and whether any attention is paid to manuring, pruning, &c. The wax is of medium quality, between beeswax and the ordinary vegetable tallows, such as Bassia butter, Borneo vegetable tallow, cocum butter, &c. Though there are shades of difference, several of these varieties of wax possess the essential properties of that formed by the bee; indeed, it was formerly supposed that bees merely collected the wax already formed by the vegetable; but Huber's experiments show that the insect has the power of transmuting sugar into wax, and that it is in fact a secretion. Japan wax is softer, more brittle and fatty than beeswax, easily

kneaded, and melts between 40 and 42°. It contains twice as much oxygen as beeswax, and has a different composition, consisting of palmitic acid, united with oxide of glyceryle. The small parcels which formerly reached this country have been used in Price's patent candle-works, in substitution for wax, for hard neutral fat, and, after conversion into the acid state, both for candles and night lights. For the last, a mixture of Japan wax and fat of low melting point makes a compact, soft, waxlike body. If the wholesale price can be reduced, this wax will find its way into extensive consumption on the Continent for various purposes.

Home Correspondence.

SOCIETY OF ARTS EXAMINATIONS AND THE LOCAL BOARDS.

Sir,—It is but just to Yorkshire and many of the Institutions comprised in the Yorkshire Union, to state that great objection was taken at the annual meeting at Rotherham, to that part of the report which animadverted on the Society of Arts Examinations; and it was only because discussion on that part of it was reserved to a subsequent period of the proceedings, that the report was allowed to pass. As it was, when the discussion came on, it was a clear understanding from the chair that the report should be revised in committee. I exceedingly regret that so unfavourable an impression of Yorkshire's estimate of the Examinations should have got abroad. At home we wonder where it has come from. Bradford, Selby, Lockwood, and other places raised their voices against it, as expressed at Rotherham. As to fairness, we never heard of anything but the strictest, and were amazed at suspicions being raised. For my own part, though on the Yorkshire Union Committee, I strongly canvassed the animadverting paragraph in the report, although I had to betray thereby my unavoidable absence from the committee when it was adopted. Facts were wanting to support it. For these reasons I greatly regretted my inability to attend the Society of Arts' Conference, with a view of hindering an impression which I take the present means to counteract. I consider it but just that we in Yorkshire, and in the Yorkshire Union, should not suffer from the impression that is gone abroad.

I am, &c.,
J. H. RYLAND.
Late President of the Bradford Mechanics' Institute, and one of the Bradford Local Board of Examiners.

July 25, 1859.

LOCAL BOARDS AND THE YORKSHIRE UNION.

Sir,—I was glad to see the letter of "A Sheffield Whittle" in your last week's *Journal*, because the more publicity is given to the subject on which it treats, the greater will be the benefit likely to result. Your correspondent, in quoting the remark of Shakspeare that "suspicion ever haunts the guilty mind," has but fallen into the error from which many who were present at the Conference were not free. I cast no reflection upon the local examiners, and therefore no repudiation of the Sheffield representative was needed, and I can readily believe that the Sheffield Board, under the able presidency of the Rev. Canon Sale, was conducted with all propriety. This was not, however, the point at issue. It is felt as an inconvenience, if not a grievance, that, as Local Boards are constituted solely of those having local interests, and, consequently, local predilections, there cannot be that confidence in their proceedings that there would be if each examination were under the supervision of a stranger to the district. The want of confidence does not necessarily imply any suspicion of unfairness, but it is an axiom of British law that no man shall be judge of a cause in the result of which he has an interest. Besides this, many of the local examiners are unaccustomed to the duty, and, with every disposition to act fairly and to the best of their ability, may not always be the best fitted to ensure a faithful performance of conditions, which are conveyed in printed instructions, and the necessity of which may not always be obvious.

I should regret exceedingly if it were supposed that I implied a charge of the slightest intentional unfairness, but when there is naturally a spirit of emulation as to the comparative results of the several examinations, it is not difficult to imagine that similar consequences may arise from involuntary negligence, and the scrupulously exact suffer in comparison with the well-meaning but less particular. It has been said that Cæsar's wife should be above suspicion, and if the certificates of the Society of Arts are to become legitimate objects of ambition for our young men, the conducting of the Examinations should be placed in the position of Cæsar's wife, and, notwithstanding the generous belief of "A Sheffield Whittle," be more entitled to general confidence than they now possess.

Your correspondent's alllusion to the fable of the fox does not say much for the sharpness which he assumes; and his remark that Yorkshire obtained one-third of the prizes without much assistance from the Institutions represented by Mr. Blake, is simply untrue, inasmuch as out of 115 successful candidates for certificates, 59 belonged to Institutes comprised in the Yorkshire Union. I may pass over his observation about riding the first horse until I can comprehend his allusion; remarking, however, that Yorkshire has, as far as numbers are concerned, kept the first place, and for the interests of Yorkshire alone has the question been raised.

However desirous the Yorkshire Union may be that the Examinations may be placed on a more satisfactory basis, there is not the slightest wish or intention to undervalue the good services of the Society of Arts; nor to deny them the honour which justly belongs to them. Nor is there the slightest ground for the assertion that the students belonging to the Yorkshire Union shrink from the contest, or are not up to the required standard, when the fact is recorded that out of of £29 awarded for prizes to Yorkshire, they had £16, and more than a moiety of the certificates.

It is to be hoped, however, that difference of opinion will not destroy the good feeling which does and ought to exist. All have the same end in view, and I trust that in the forthcoming preparations for the next examinations, there will be that generous rivalry which cannot fail to prove beneficial to both parties.

I am, &c.,
BARNETT BLAKE.

Leeds, 25th July, 1859.

ELECTRO-DEPOSITS ON ENGRAVED COPPER-PLATES.

Sir,—Were I to allow M. Joubert's observations on Electro-plating Engraved Plates, which appeared in your impression of yesterday, to pass unnoticed, it would be a silent admission on my part that my previous statements on the subject were erroneous.

I stated that:—"Practically speaking, 2000 impressions from a zinc deposit are as good as 5000 from an iron deposit, especially if the same means for re-coating apply to one as to the other."

In reply M. Joubert says "Now, suppose Mr. Bradbury receiving another order for 1,200,000 impressions, like the one he alludes to in his letter, and see the result. He would require to have 600 coatings, whereas, through my process, (as acknowledged by Mr. Bradbury himself), 225 coatings at most would only be required. Is Mr. Bradbury prepared to maintain that, in point of expense, labour, and saving of time, the result would be the same in both cases?"

In point of expense, the result is materially different. 600 electro-zinc facings cost (including material and

labour) £33 15s.; 225 electro-iron facings would cost, according to M. Joubert's scale of charges, £303 15s.; though electro-iron facing ought not to cost more than one farthing per square inch. In all probability, too, more than 225 electro-iron facings, as executed by M. Joubert, would be required, as his electro-iron facings have varied from 1000 to 9000 impressions. My assertion is thus correct, both on scientific and practical grounds; and however *startling* it may appear, the assertion is nothing compared with the result.

The removal of the worn-out electro-iron or electro-zinc facing before re-coating is indispensable; if the electro-facings in either case could not be removed, the processes would be useless, the electro-facings forming, in the case of iron and zinc, actual thicknesses of metal; neither process will admit of a second deposit, the second electro-facing being not adherent enough to the first; even were it possible to make it so, the parts worn out in the first electro-facing show in the printed impression from the second. This, however, is not the case with an electro-nickel facing; the metal is so different, both in density and substance, that filling up any portion of the work, however fine, is an impossibility.

My practical knowledge (not my want of it, as M. Joubert observes) enables me again to state that electro-nickel facing, capable of yielding 5000 impressions, does admit of being re-coated, *ad libitum*, without destroying the integrity of the work, and without requiring the removal of each coating. There is no difficulty in removing an electro-nickel facing, if the plate, in the first instance, be prepared in a certain manner, so that the nickel facing upon it, as in the case of iron and zinc, may be removed by acid, if necessary.

Without such preliminary preparation, an attempt to remove an electro-nickel facing, either by electro or chemical means, *could* only be attended with absolute and irrecoverable injury to the plate.

Those who feel disposed to try electro-nickel facing will find that my statements are not only scientifically, but practically, true. All that need be said is, that no difficulty is experienced in the ordinary course of business in carrying out the substance of this communication.

I have no wish to interfere with M. Joubert's electro-iron-facing. My only desire is to make known certain results obtained from a series of experiments in this department of printing; and it appears to me that it is a course which ought to be pursued by every lover of his profession. I am, &c.,

HENRY BRADBURY.

Whitefriars, July 26th, 1859.

RIFLED ORDNANCE.

SIR,—In order that good practical results may arise from the present system of rifling all heavy ordnance, the bore, at least, of the cannon must present a surface fit to receive and maintain the grooves, and the body of the gun must also possess sufficient tensile strength to resist the explosive power required to drive the enormous shot now in use.

If the surface of the bore, however polished, of the best cast-iron guns be examined with good eyes, or with a magnifier, it will be found to consist entirely of a series of pores and crystals, and the first fracture of a piece of cast-iron will at once display the cause, that is to say, it will present the appearance of a box of common kitchen salt, with the crystals very closely pressed together, but not in contact, in all points. Cast-iron alone, therefore, is a material utterly unfitted for our present practice with rifled ordnance, elongated shot, and long range.

If you will have the goodness to refer to the third volume of the *Journal of the Society of Arts*, you will find, at page 78, that I there first described and published, in 1854, the only mode of constructing guns that would bear the rifle grooves, and be of sufficient strength to resist the great explosive power now universally adopted. In the spring of 1856, my process of forming the bore of all heavy guns, by means of a spiral coil of mild steel in its soft state, or of the best wrought iron with a cast-metal jacket outside, was fully and unconditionally laid before the authorities of the War Department, but unfortunately the regulations of the Board of Ordnance entirely prevented its being carried out.

The authorities of the Royal Arsenal could not receive and subject to proof a working model that would only carry a spherical ball one inch and a half in diameter, such as I could construct with means at my own disposal; neither could they allow me to direct and superintend the construction of a larger piece adapted to such means as the Royal Arsenal then possessed, but they required me to produce, for trial and proof, a full-sized ten-inch gun, and when I stated that my means were utterly inadequate to do so, they directed me to apply to some of the great iron works. In accordance with that advice, I made application to several large iron and steel works, among others to the Gospel Oak Works, at Tipton; the Cyclops Steel Works, at Sheffield; the Mersey Iron and Steel Works, Liverpool, &c., and the answer was uniformly a polite but flat refusal to construct a single gun only, of a new form, even for the Royal Arsenal at Woolwich.

At this point of course the matter completely dropped, and now that the spiral-coil bored guns are coming into general use, I hope that the impartial justice you uniformly display may induce you to be kind enough to allow this statement to appear in your columns.

I am, &c.,

HENRY W. REVELEY.

Poole, Dorset.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on 2nd and 4th July, 1859.

13. Bills—Poor Law Boards (Payment of Debts).
16. „ Law of Property and Trustees Relief Amendment.
29. „ Court of Probate, &c. (Acquisition of Site).
30. „ Locomotive.
Italy (British Officers)—Correspondence.
Portugal (Communication by Post)—Convention.

Delivered on 5th July, 1859.

47. Constabulary (Ireland)—Statement.
50 Dover Mails—Copies of Contracts, &c.
57. Navy Estimates—Abstract and further Supplementary Estimate.
31. Bill—Weights and Measures Act Amendment.

Delivered on 6th July, 1859.

52. National Collections—Return.
32. Bills—Public Health.
33. „ Clerk of the Council.

Delivered on 7th July, 1859.

63. Post Office Department (Packet Service)—Estimate.
61 (2). Army—Supplementary Estimate, &c.
65. Committee of Selection—3rd Report.
68. Navy (Screw Steamers)—Return.
69. Navy (Ships and Vessels)—Return.
70. Navy (Dockyards)—Return.
62. Navy Estimates.
17. Bills—Criminal Procedure.
18. „ Public Justices Offences.
19. „ Malicious Injuries.
20. „ Coinage Offences.
21. „ Personation.
22. „ Forgery.
23. „ Offences against the Person.
24. „ Larceny.
25. „ Criminal Writings.
26. „ Punishment.
27. „ Oaths, &c.
28. „ Grain, &c.
35. „ Law Ascertainment Facilities.
36. „ Admiralty Court.
39. „ Roman Catholic Relief Act Amendment.
40. „ Church Rates Commutation.
Inland Revenue—3rd Report of Commissioners.

Delivered on 8th July, 1859.

61. Army Estimates.
61 (1). Army Supplemental Estimate.
67. Hocquard *v* the Queen—Return.
37. Bill—Salmon Fishery.

FIRST SESSION, 1859.

208 (A 1). Poor Rates and Pauperism—Return (A).

Delivered on 9th and 11th July, 1859.

59. Revenue Departments—Estimates.

60. Civil Contingencies—Account and Estimate.
73. Public Income and Expenditure (Balance Sheet)—Account.
58. Civil Service Estimates—Classes 1 to 6.
74. Railway and Canal Bills—3rd Report from Committee.
71. Railway and Canal Bills—Board of Trade Report.
38. Bills—Tramways (Ireland).
44. „ Highways.
Right of Visit—Correspondence with the United States Government.

Delivered on 12th July, 1859.

48. East India (King of Delhi)—Copy of a Letter.
49. East India (Judicial Procedure)—Copy of Despatch.
53. Exchequer—Account.
72. Turnpike Roads and Bridges (Essex)—Returns.
78. Statute Law Consolidation—4th Report of Commissioners.
45. Manning of the Navy—Papers.
41. Bills—Railway Companies Arbitration.
45. „ Criminal Justice (Middlesex) (Assistant Judge)—(Amended).
46. „ London Corporation.

Delivered on 13th July, 1859.

55. Loan Societies—Abstract of Accounts.
76. Proprietors (Scotland)—Return.
83. National Portrait Gallery—2nd Report of the Trustees.
85. Navy—Supplementary Estimate.
34. Bills—Diplomatic Pensions.
43. „ Metropolis Carriage-ways.
47. „ Judgments (Ireland).
48. „ Westminster New Bridge.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 22, 1859.]

Dated 27th May, 1859.

1310. L. D. Jackson, 32, Finsbury Market, Finsbury—An improved machine for cutting wood.

Dated 22nd June, 1859.

1498. W. Buckwell, Phœnix Stone Works, East Greenwich—Manufacturing materials for building and other structural purposes, and of the machinery applied thereto, which last invention is applicable to other purposes.

Dated 23rd June, 1859.

1510. A. J. Dessales, 13, Rue des Enfants Rouges, Paris—An imp. in the working and securing of sliding tubes, applicable to gas chandeliers, lamps, and other purposes.

Dated 30th June, 1859.

1554. A. Gueyton, Paris—Imp. in enamelling articles of jewellery, applicable also to other similar purposes.

Dated 5th July, 1859.

1598. J. H. Nalder, Alvescott, Oxfordshire, and T. Nalder, Challow Works, Berkshire—Imp. in winnowing and dressing grain and seeds, and in the machinery or apparatus employed therein.

Dated 6th July, 1859.

1600. W. H. Ward, Auburn, Cayuga, U.S.—Ocean marine signal telegraphing for day and night, whereby messages and communications on all occasions and subjects may be given with clearness and despatch, within seeing distance, day or night.
1608. B. Seed, Keighley, and T. Steel, Bradford—Imp. in apparatus employed in the treatment of soap suds or other saponaceous or oily matters.

Dated 7th July, 1859.

1610. D. T. Jones, Headless Cross, Ipsley, Warwickshire—Imp. in ploughs.
1611. C. F. Vasserot, 45, Essex-street, Strand—An improved form of regulator, chiefly applicable to water wheels. (A com.)
1612. F. A. Le Mat, New Orleans, U.S.—Imp. applicable to ordnance.
1614. R. C. Rapier, Newcastle upon-Tyne—Imp. in working rolls for rolling plates of unequal thicknesses.
1618. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in knitting-frames. (A com.)

Dated 8th July, 1859.

1619. G. Ellis, 4, Collier-street, Pentonville—The imp. of muffs, to be called "the patent reticule travelling muff."
1620. W. H. Dawes, Bromford Iron Works, West Bromwich, Staffordshire—An imp. or imps. in the manufacture of iron.
1662. F. A. Le Mat, New Orleans, U.S.—Imp. in the construction of revolving or repeating fire-arms.
1624. G. Cartwright, Birmingham—Imp. in corks for bottles and jars.
1625. G. A. Boggis, Croxted-place, Dulwich, Surrey—Imp. in rendering boots and shoes waterproof.
1626. E. Livermore, New York, U.S.—Imp. in the manufacture of burning fluids for illuminating and heating purposes. (A com.)
1627. D. Mathews, Eshald Well Brewery, Oulton, near Leeds—Imp. in apparatus for refrigerating and heating liquids.
1628. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in moulding or shaping metals by pressure, and in the machinery or apparatus employed therein. (A com.)
1629. W. H. Harfield, Fenchurch-street—Imp. in ships' capstans and riding bits.
1630. H. Brinsmead and J. Lawrence, Ipswich—Imp. in rotatory screens.
1631. J. Taylor, Roupell-park, Streatham-hill, Surrey—Imp. in the construction of walls to prevent damp from rising, and also in tiles to be used for this purpose in building walls.
1632. T. D. Duppa, Longville, Winstanton, Shropshire—Imp. in carpenters' benches.
1633. W. Woof, Gloucester—Imp. in ploughs.
1635. W. N. Nicholson, Newark-on-Trent—Imp. in clod crushers and land and garden rollers.

Dated July 9th, 1859.

1636. M. Henry, 84, Fleet-street—Imp. in the manufacture of over-shoes and other articles worn on the feet, and in the apparatus employed therein. (A com.)
1637. B. Samuelson, and J. Shaw, Britannia Works, Banbury—Imp. in reaping and mowing machines.
1638. F. Ayckbourn, 27, Henry-street, Vauxhall-gardens, Surrey—Constructing certain articles of dress, so as to prevent drowning.
1639. C. Iliffe, Birmingham—Imp. in the manufacture of buttons.
1641. E. Livermore, New York, U.S.—Imp. in generating gas for the purpose of lighting and heating.
1642. J. Smith, Bradford, Yorkshire—Imp. in apparatus for heating and cooling water.

Dated July 11th, 1859.

1643. E. F. Hutchins, Albert cottages, Perry-street, Northfleet, Kent—Constructing the jaw or jaws of vices, and holding tools in general with a ball and socket joint.
1644. R. Clegg, Islington—Imp. in machines for cutting wood and metal, and in the means of fixing saws thereto. (A com.)
1645. H. Davies, 13, Leicester-buildings, King-street, Liverpool—Imp. in the manufacture of soap.
1646. J. C. Pickard, Burnley, Lancashire—Imp. in weft forks for looms.
1647. W. E. Newton, 66, Chancery-lane—Imp. in magneto-electric machines. (A com.)
1648. J. Dible, Northam, Hants, and W. H. Graveley, Upper East Smithfield—Imp. in apparatuses for ventilating and lighting ships.
1649. F. Burden, John street, Adelphi—Imp. in the permanent way of railways.
1650. J. A. Hartmann, Mulhouse, France—Imp. in the manufacture of colours for printing cotton and other vegetable fibres and silk.

Invention With Complete Specification Filed.

1690. M. Cranston, 11, New Broad-street—Improved delivery apparatus for harvest machines. (A com.)—July 16, 1859.

WEEKLY LIST OF PATENTS SEALED.

[*From Gazette, July* 22, 1859.]

July 22nd.	240. F. C. C. Paulsen and A. Alsing.
202. B. Templar.	370. W. E. Newton.
203. E. Dorsett & J. B. Blythe.	395. T. Willis and G. Chell.
212. R. A. Brooman.	617. A. V. Newton.
213. J. Laubereau.	833. T. Richardson and G. W. Jaffrey.
214. J. Smith and W. H. Smith.	851. L. Brierly and H. Geering.
215. J. Savory & W. R. Barker.	1263. W. Crum.
217. A. Warner and W. Tooth.	
227. J. White.	
238. D. Graham.	

[*From Gazette, July 26th*, 1859.]

July 26th.	342. M. Curtis and J. Miller.
246. E. Dixon & H. Whittaker.	343. J. Lee.
253. W. Crowther.	359. T. S. Cressey.
254. J. Gathercole.	373. H. P. Burt.
255. I. Zacheroni.	388. R. Cogan.
259. F. Prince.	390. C. Jackson.
266. J. Mackenzie.	412. J. L. Clark.
270. J. J. A. de Bronac, and A. J. M. Deherrypon.	451. C. Garton.
	529. J. H. Johnson.
272. T. P. Smith.	662. H. Ambler.
274. J. Raywood.	875. J. Bindley and J. L. Hinks.
289. R. A. Brooman.	948. J. Chapman.
297. E. Wilkins.	1158. J. Luis.
307. T. Storer.	1228. C. Law.
330. W. Clark.	1319. W. Crum.

Patents on which the Stamp Duty of £50 has been Paid.

[*From Gazette, July* 22, 1859.]

July 18th.	1742. J. Onions.
1707. W. A. Jump.	1749. J. Derbyshire.
1708. W. A. Jump.	*July 20th.*
1711. W. Papineau.	1715. E. Leak.
1748. H. Doubleday.	1729. C. Amet.
July 19th.	810. W. E. Newton.
1719. J. Clark.	1984. W. H. Perkin.
1725. J. E. Hodges.	

[*From Gazette, July 26th*, 1859.]

July 21st.	1834. N. Cadiat.
1768. T. Byford.	*July 23rd.*
1793. J. Knowles & W. Buxton.	1760. C. T. Judkins.
2021. H. Conant.	1766. E. Lord, T. Lord, A. Lord, and W. Lord.
July 22nd.	
1741. F. Petts.	1770. T. Wrigley.
1759. G. A. Copeland.	1776. J. Denis.
1781. S. Yeadon & G. Chapman.	